Reducing Lithium Voltage Cell Wear Through Purposeful Introduction of Electron Backflow

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Introduction

Methods are desired for extending the life of lithium-ion batteries. The wear of the lithium anodes is actually the byproduct of nano-scale cracking and deformation of the anode according to recent research findings, although there is not a consensus as to the cause of this deformation.

Abstract

This author proposes that lithium anode distortion is the result of the cumulative force of the discrete magnetism of individual electrons in the aggregate. The particular physical structure of an anode at the nanoscopic level is reminiscent of a terrain map of the Earth and its valleys and ridges. These terrain features force electrons to favor some paths over others and to orient their spin in such a way so as to direct their discrete magnetism toward specific areas each and every time rather than fostering a random distribution of electron paths and spin orientations.

If we think of the anode as a carpet which can have a hole worn in it by treading over the same areas repeatedly, it becomes clear that the objective must be to randomize the path and spin orientation of the electrons as they travel through the anode. Counterintuitively, the best way to achieve this randomization is to incorporate special capacitors within the anode which are designed to introduce a backflow of electrons out of the anode during charging and back into it during discharge.

These backflowing electrons would interact with electrons flowing in the opposite direction and would force them to vary their spin randomly. So long as electrons are attempting to flow in two opposing directions at the same time, electrons flowing in both directions could be predicted to follow random paths rather than to settle into the contours of the material and follow the path of least resistance.

Conclusion

By introducing what appears to be an inefficiency, wear is prevented and voltage cell life can actually be greatly extended at the expense of slightly decreased rates of charge and decreased maximal output power.